

# **INFLUENCE OF THE PROTON CONCENTRATION ON THE PROPERTIES OF THE $\text{LiNbO}_3$ and $\text{LiTaO}_3$ CRYSTALS**

Interim report 1

by

M.P. DE MICHELI

June 1996

United States Army

EUROPEAN RESEARCH OFFICE OF THE U.S. ARMY  
London England

CONTRACT NUMBER : N68171-96-C-9040

DTIC QUALITY INSPECTED 3

Laboratoire de Physique de la Matière Condensée  
CNRS  
Parc VALROSE, 06108 NICE CEDEX2, FRANCE

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19970506 062

REPORT DOCUMENTATION PAGE			
1. AGENCY USE ONLY	2. REPORT DATE 06/12/96	3. REPORT TYPE AND DATES COVERED MAY-JUNE 96	
4. TITLE : Influence of the proton concentration on the properties of the LiNbO <sub>3</sub> and LiTaO <sub>3</sub> crystals		5. FUNDING NUMBERS	
6. AUTHOR : M.P. DE MICHELI			
7. PERFORMING ORGANIZATION NAMES AND ADDRESSES Laboratoires de Physique de la Matière Condensée, Parc Valrose, 06108 NICE Cedex 2 , FRANCE		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING, MONITORING AGENCY NAMES AND ADDRESSES		10. SPONSORING, MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES			
12A. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; distribution unlimited.		12B. DISTRIBUTION CODE	
13. ABSTRACT/ In the proposal we wrote one year ago, the work plan for the first year was to compare between as exchanged waveguides and annealed waveguides presenting the same index profiles in order to determine if the proton concentration in a given phase is fixed or depends on the fabrication conditions, extra protons, sometimes called "interstitial protons" being introduced in some cases. We planed to do this on LiTaO <sub>3</sub> where we knew the phase diagram of the exchanged layers. But today, the phase diagram of the LiNbO <sub>3</sub> is also known, so this study will be transferred to this crystal, which presents more interest for the application we are presently considering : the realization of an Integrated Optical Parametric Oscillator, but the work plan will be exactly the same.			
14. SUBJECT TERMS		15. NUMBER OF PAGES	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF THE REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

## **Work plan for the first year**

In the proposal we wrote one year ago, the work plan for the first year was the following :  
Comparison between as exchanged waveguides and annealed waveguides presenting the same index profiles in order to determine if the proton concentration in a given phase is fixed or depends on the fabrication conditions, extra protons, sometimes called "interstitial protons" being introduced in some cases. This work will first be done on  $\text{LiTaO}_3$  where we know the phase diagram of the exchanged layers and covers :

- Planar waveguide fabrication following different recipes

- Index profile measurements

- Rocking curves to determine the crystalline quality and the phase of the exchanged layer

- SIMS measurements to determine the proton concentration profile.

Today, the phase diagram of the  $\text{LiNbO}_3$  is also known, so this study will be transferred to this crystal, which presents more interest for the application we are presently considering : the realization of an Integrated Optical Parametric Oscillator, but the work plan will be exactly the same.

We have then started to produce waveguides in all the possible phases (7). Some of this phase are obtainable with different recipes, such as direct exchange or exchange followed by annealing. In order to be able to distinguish between these different possibilities we will prepare similar waveguides using both techniques.

Making the waveguides and doing the optical characterization will last about 3 months. Samples will then be sent to the partners for proton concentration measurements and crystallographic examination.